Effects of Pre-Corrosion on the Corrosion Inhibition Performance of Three Inhibitors on Q235 Steel in CO₂/H₂S Saturated Brine Solution

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Effects of pre-corrosion on the corrosion inhibition performance of three inhibitors on Q235 steel in a CO₂/H₂S saturated brine solution were investigated with potentiodynamic polarization, electrochemical impedance spectroscopy (EIS), scanning electron microscope (SEM), X-ray diffraction (XRD), energy dispersive spectrometer (EDS), and X-ray photoelectron spectroscopy (XPS). The results showed that the corrosion rate of steels was decreased significantly after pre-corrosion for different times indicating a good protection effect of the pre-corrosion products, which were composed of mostly FeS and limited FeCO₃. The inhibitors could both inhibit the CO₂/H₂S corrosion of freshly abraded Q235 steels and the pre-corroded ones, but the pre-corrosion could gradually deteriorate their inhibition performances with the increase of pre-corrosion time. And the difference in their inhibition performances became relative distinct after pre-corrosion for 7 days possibly due to the differences of their molecular structures. According to the XPS results, the inhibitor films could be formed on the surface of the corrosion product layer. However, the corrosion species might be also diffused to the steel surface through the diffusion channels in the corrosion products and attack the steel matrix.

Keywords: Tetradecyl trimethyl ammonium bromide; N-benzyl pyridinium chloride; Imidazoline quaternary ammonium salt; Pre-corrosion; Acid corrosion

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